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## **Studies on *Alternaria* spp. associated with medicinal plants in Uttar Pradesh**

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### **Abstract**

Many types of plants are known for their medicinal value. Drugs are obtained from their roots, stems, branches, barks, leaves, flowers, fruits and seeds. Like other plants, the medicinal plants also suffer from several maladies. Seventeen such plant species were collected which were affected from fungal pathogens. On isolation and their morphological studies, six species of *Alternaria* were identified associates with them. A comparative study was made on the symptomatology of diseases for their diagnosis.

**Keywords-** *Alternaria* spp., Medicinal plants, Leaf spots and blight

### **Introduction**

Medicinal plants of various natures have traditionally been used from time immemorial especially by tribal people. Right from roots to their leaves, flowers, fruits, seeds and barks are utilized directly or in the form of their extracts in the preparation of Auyurvedic and Homoeopathic medicines (Schery, 1952). Central Institute of Medicinal and Aromatic Plants (CIMAP) located at Lucknow in Uttar Pradesh is the leading centre of world in conducting the valuable research on the various aspects of medicinal plants. A comprehensive account of diseases of medicinal plants is available in some of the literature compiled by Srivastava et al. (2006), Chakrabarti et al. (2010) and the list of causative agents by Bigrami et al. (1991) No work appears to have been done in Uttar Pradesh on leaf spots and blight of medicinal plants caused by different species of *Alternaria*. Efforts have been made in this communication on the symptomatology of *Alternaria* diseases of 17 medicinal plants collected from different places of Uttar Pradesh.

### **Materials and methods**

A number of medicinal plants affected from various diseases were collected by personal visits in various gardens and parks of Kanpur and Lucknow and adjoining areas.

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During the course of investigation on the taxonomy and parastism of *Alternaria* spp. associated with medicinal plants, a number of species of *Alternaria* were isolated. Their comparative symptomatology and etiology was made from different hosts of these plants, Morphological studies of different species of *Alternaria* was made in nature (host) and in culture (PDA). Pertinent literature were consulted for the correct identification of medicinal plants as well as *Alternaria* spp. associated with them.

## Results and discussion

Out of collection made from medicinal plants, 17 plant species were found to be affected from leaf spots, blight, lesions on stems and branches and in some cases on their balls also.

**Table 1: Association of *Altrnaria* spp. with medicinal plants**

| Medicinal plants          | Scientific Names   | <i>Alternaria</i> spp. and their reports   |
|---------------------------|--|--|
| 1. Brasil                 | <i>Ocimum sp.</i>  | <i>Alternaria</i> sp.<br>(Srivastava <i>et al.</i> , 2006)   |
| 2. Citronella             | <i>Cymbopogon citratus</i>                                     | <i>A. alternata</i><br>(Srwar <i>et al.</i> , 1980)  |
| 3. Patchouli              | <i>Pogostemon cablin</i> (Syn. <i>P. Patchouli</i> )           | <i>A. alternata</i><br>(Mukerji and Bhasin, 1986, parameswaran <i>et al.</i> , 1987)   |
| 4. Foxglove               | <i>Digitalis purpurea</i>                                      | <i>Alternaria</i> sp.<br>(Srivastava <i>et al.</i> , 2006)   |
| 5. Geranium               | <i>Pelargonium graveolens</i>                                  | <i>A. alternata</i><br>(Kalra <i>et al.</i> , 2000)  |
| 6. Mints                  | <i>Mentha</i> spp.<br><i>M. arvensis</i><br><i>M. piperita</i> | <i>A. alternata</i><br>(Ganguli & Pandotra, 1962)<br>(Srivastva & Srivastava, 1971)  |
| 7. Opium poppy            | <i>papaver somniferum</i>                                      | <i>A. Phragmosporae</i> (Gupta <i>et al.</i> , 1989)<br><i>A. alternata</i> (Kishore <i>et al.</i> , 1987)<br><i>A. papaveris</i> (Narain, 1991) |
| 8. Sarpagandha            | <i>Rauvolfia serpentine</i>                                    | <i>A. alternata</i> (Srivastava <i>et al.</i> , 2006)  |
| 9. Ashwagandha            | <i>Withania somniferum</i>                                     | <i>Alternaria alternata</i><br>(Narain and Saksena, 1974)  |
| 10. Madar                 | <i>Calotropis procera</i>                                      | <i>Alternaria alternata</i><br>(Narain and Saksena, 1974)  |
| 11. Dhatura (Thorn apple) | <i>Datura stramonium</i><br><i>D. metel</i>                    | <i>A. crassa</i> (Rands, 1917)   |
| 12. Senna                 | <i>Cassia angustifolia</i><br><i>C. acutifolia</i>             | <i>A. alternata</i> (Chakrabarti <i>et al.</i> , 2010)   |
| 13. Night shade           | <i>Solanum khasianum</i>                                       | <i>A. solani</i> (Hiremath <i>et al.</i> , 1980)   |
| 14. Makoy                 | <i>Solanum nigrum</i>  | <i>A. Solani</i> (Narain and Saksena, 1974)  |
| 15. Bhatkataiya           | <i>Solanum xanthocarpum</i>                                    | <i>A. solani</i> (Roy and Prasad, 1980)  |
| 16. Linseed               | <i>Linum usitatissimum</i>                                     | <i>A. Linicola</i> (Groves and Skolko, 1944)   |
| 17. Fenugreek             | <i>Trigonella foenum</i><br><i>Graccum</i>                     | <i>A. alternata</i> (Singh and Chohan, 1973)   |

The study on the symptoms of disease and morphological characters of the causative *Alternaria* species was made. Out of 17 medicinal plants, eleven were found to be affected from *Alternaria alternata*, three from *Alternaria solani* one each from *Alternaria crassa*, *Alternaria linicola* and two species viz., *Alternaria papaveris* and *A. phragmosporae* were observed to be associated with opium poppy (Table 1).

*Alternaria alternata* is a species of common occurrence in nature and is cosmopolitan in its distribution (Ellis, 1971; Rotem, 1994). *A. alternata* is considered as saprophyte to parasitic in nature and it was observed to cause the leaf spots and blight on eleven plants thus, parasitizing about three fourth of total medicinal plants. *Alternaria alternata* in general produces initial symptoms as minute, dark brown to black circular spots at the tip or margin of leaves or leaflets. They later enlarge and become irregular in shape and brown to light black in colour. Sometimes chlorosis from leaf tips and margins spreads over the whole leaf causing drying and defoliation (Mehrotra and Narain, 1969; Ellis, 1971). The leaf spot due to *Alternaria alternata* has been reported from India on mints viz., *Mentha arvensis* (Ganguly and Pandotra, 1962) and *M. piperita* (Srivastava and Srivastava, 1971). Infection appears in the form of round to oval or slightly irregular dark brown spots. The spots consist of concentric rings/zones, which are surrounded by pale yellow margins (Jam, 1995). Spots later coalesce forming large patches leading to defoliation, which is often heavy, with a marked decrease in essential oil content (Ganguly and Pandotra, 1962). An *Alternaria* blight of patchouli caused by *Alternaria alternata* was first observed Mukherji and Bhasin, 1986 and later by Parameswarn *et al.*, (1987) during summer months. This fungus has also been reported as causative agents for leaf blight and bud rot of Sarpagandha (Srivastava *et al.*, 2006). *Alternaria alternata* is also known to cause the leaf spot in Citronella (Sarwar, 1980). Foxglove (*Digitalis purpurea*) suffers from the leaf blight due to *Alternaria* sp., characterized by the formation of brown spots which enlarge in size covering larger areas of leaves. The basil (*Ocimum* sp.) is susceptible to the leaf spots caused by fungal pathogens including *Alternaria* species (Srivastava *et al.*, 2006).

*A. alternata* was found to be associated with Ashwagandha and Madar (Narain and Saksena, 1974), Senna (Chakrabarti *et al.*, 2010) and fenugreek (Singh and Chauhan, 1973). Scented geranium or rose geranium (*Pelargonium graveolens*) oil is of great medicinal value and the plant is affected by a number of diseases in which *Alternaria* blight caused by *Alternaria alternata* is one of them (Kaira *et al.*, 2000). The disease symptoms first appear on the leaf margins as brown necrotic spots, which later spread towards the mid ribs resulting inward curling, complete necrosis and chlorosis of leaves.

The opium poppy (*Papaver somniferum*) of family Papaveraceae is an annual herb. It contains many alkaloids of medicinal value. The plant of poppy suffers from leaf spot and blight caused by three species of *Alternaria* viz., *A. alternata* (Kishore *et al.*, 1987), *A. phragmosporae* (Gupta *et al.*, 1989) and *A. Papavaris* (Narain, 1991). The characteristic symptoms of disease appear on leaves as small dark brown spots scattered on lamina, later

coalescing to involve greater areas causing the leaf blight appearance. Necrotic lesions also appear on balls due to infection of *A. papaveris*, a host specific species of *Alternaria* on *Papaver somniferum* (Narain and Kant, 2008). *Alternaria solani* was found to be associated with three plant species of medicinal value belonging to family *Solanaceae* viz., *Solanum nigrum* (Narain and Saksena, 1974), *Solanum khasianum* (Hiremath *et al.*, 1980) and *Solanum xanthocarpum* syn. *Solanum surratense* (Roy and Prasad, 1980). *A. solani* is the representative species of family *Solanaceae* (Narain and Kant, 2008) and it produces round, oval or irregular brown or dark brown often concentrically ridged target spots. Under favourable conditions, leaf spots enlarge rapidly and may eventually involve as much as half a leaf (Ellis, 1971). *Alternaria crassa* on *Datura metel* and *D. stramonium* causes irregular straw coloured zonate spots which appear first on lower leaves and spread gradually upwards; dark sunken lesions may be formed on the seed pods (Rands, 1917). Linseed (*Linum usitatissimum*) has traditionally been used to cure the boils and other ailments and this medicinal plant suffers greatly due to leaf spots and bud rotting in the field caused by *Alternaria linicola* (Groves and Skolko, 1944). The causative fungus is also known to reduce the quality and quantity of oil.

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